

## **Attachment1: Overview of National PM<sub>2.5</sub> Monitoring Networks**

The current planned scope of the national PM<sub>2.5</sub> network consists of three major components: Mass monitoring, routine chemical speciation and special study areas termed “supersites”. In very broad terms, the network as a whole supports three principal regulatory objectives: 1) Determining nationwide compliance with the NAAQS, 2) State Implementation Plan (SIP) development (e.g., source attribution analysis and air quality model evaluation, and 3) tracking trends and progress of emissions reduction strategies. EPA recognizes that, with care in design and execution, components of this program can also provide significant support for priority research needs. The following brief description is intended to provide background for understanding the context and relationship among these components and between them and EPA’s research program. The EPA in partnership with State and Local agencies is deploying a comprehensive monitoring network consisting of :

1. Approximately 1100 Federal Reference (or Equivalent) Method (FRM/FEM) compliance samplers for determining attainment and nonattainment status. The majority of FRM/FEMs established by 12/31/98 and completed by 12/31/99 (note: EPA requires a 3 year Calendar record of data for compliance purposes);
2. Approximately 100 continuous mass samplers for quick response reporting, to capture diurnal mass concentration fluctuations, and assist health effects and exposure studies (to be deployed by 12/31/99);
3. Approximately 300 chemical speciation samplers to characterize major mass components, detect their trends and provide a basis for SIP development efforts (e.g., emissions and air quality model evaluation, source-receptor analyses). Deployment of the speciation program will be start in mid-1999; and
4. 4 - 10 “Supersites” that provide enhanced temporal and chemical composition data to assist both SIPs and health effects and exposure studies, and accelerate deployment of advanced sampling methods. The program will be phased in over a 2 - 3 year period starting in 1999 and lasting approximately 5 years.

These components, with the exception of Supersites, are funded by Federal Section 103 Grants to State and Local agencies and expected to be in place for several years. The attached table outlines for each category below a synopsis of the budgeted number, major purposes, and potential flexibility for integration with PM research programs.

## MASS MONITORING (1100)

1. **Core mass monitoring (850).** Approximately 850 NAMS/SLAMS sites, required according to EPA guidance to the States, will be dedicated to mass monitoring. A breakdown of these 850<sup>1</sup> sites includes 750 required for NAAQS compliance and 100 sites for characterizing background and transport. The regulation requires a continuous sampler to be collocated with an FRM/FEM at the 52 largest cities (greater than 1,000,000 population).
2. **Mass samplers for spatial averaging and special purpose monitoring (SPM)( 200).** Roughly 200 additional sites to accommodate spatial averaging<sup>2</sup> and special purpose monitoring needs are expected to be deployed. The SPM sites are those established to identify unique source location or communities, and are not required to be compared to the NAAQS if operating less than 2 years (or a sampler without FRM/FEM designation).
3. **Continuous monitoring (50).** In addition to the required collocated 52 continuous monitors, plans include deployment of an additional 50 continuous samplers. Collectively, at least 100 continuous samplers will be deployed, and probably more, since the States can elect to purchase and operate continuous samplers for sites designated as special purpose monitoring.

### *Principal objectives for mass monitoring:*

- (a) FRM/FEM samplers and NAMS/SLAMS. The primary objective for mass monitoring, especially the designated NAMS/SLAMS<sup>1</sup> sites is for comparison to the PM<sub>2.5</sub> NAAQS. In addition, 100 NAMS/SLAMS will serve as background and transport sites, integrated with other efforts such as IMPROVE, to characterize regional transport and background concentrations.
- (b) Continuous samplers. Continuously operating samplers will provide a real time estimate of PM<sub>2.5</sub> levels and allow for input into public information displays (similar to current ozone mapping efforts that reach local weather forecast venues) as well as the Pollutant Standards Index (PSI). Other objectives for continuous samplers include developing statistical relationships with FRM/FEM's to serve as potential surrogates for compliance indicators, and characterizing diurnal patterns of exposure and emissions.

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<sup>1</sup> EPA network guidance (40CFR58) requires 850 NAMS/SLAMS sites; however, 100 of those sites are to be designated as background or transport sites (2 per State) which can use the IMPROVE sampler, which is not designated as an FRM/FEM and therefore would not be used for NAAQS comparisons.

<sup>2</sup>The annual PM<sub>2.5</sub> standard is specified as reflecting an area-wide distribution or spatial average of a representative single monitor or the average of multiple monitors. States have requested additional monitors to provide for spatial averaging.

- (c) Special Purpose Monitors (SPM's). The SPM samplers are intended to provide flexibility for State and local agencies to investigate areas that may have exceedances without the repercussion of regulatory requirements associated with a NAAQS violations. The purpose of SPM's is to encourage monitoring where it might otherwise be discouraged due to fear of associated regulatory requirements. The SPM's are expected to be located in unique or rural communities subject to localized sources, or enhance the regional/background/transport network to better characterize multiple spatial scale interactions. Samplers for SPM purposes can be FRM/FEM that operate less than 2 years, or non- FRM/FEM samplers. Many State and local agencies are expected to operate continuous samplers within the classification of SPM sites.

### **ROUTINE CHEMICAL SPECIATION (300).**

The routine chemical speciation program consists of two components: 50 required NAMS, and up to 250 additional sites (EPA's contribution to the IMPROVE program technically is similar to the routine speciation program but addressed separately due to budget considerations). The major purpose of these sites is to assess long-term trends in major PM<sub>2.5</sub> components, as well as to provide useful information for source apportionment, evaluating current and future control programs, and health risk assessments.

1. **NAMS (50)**. The regulation requires 50 speciation sites across the country, located mostly in urban areas (e.g., all PAMS cities will have a speciation site). These 50 sites will be designated as NAMS and will follow sampling and analysis protocols similar to the existing Interagency Monitoring of Protected Visual Environments (IMPROVE) program. Filter sampling techniques (teflon, nylon and quartz media) for 24-hour periods will be analyzed for principal mass components: most elements through X Ray Fluorescence; major ions through Ion Chromatography/Colorimetry (nitrates, sulfates, chloride/ammonium); and organic and elemental fractions of carbon through Thermo analysis. The sampling methodology and frequency (1-in-6 day or greater) are being evaluated in light of peer review comments. Prescriptive protocols for sampler selection, analytes, and sampling frequency will be adhered to ensure national consistency across space and time.
2. **Other "Routine" Speciation Sites (250)**. In addition to the NAMS, resources are expected to be available to support up to 250 additional sites. These sites will be less prescriptive than the NAMS and will be subject to a balance among competing needs for national consistency (50 sites are not adequate to characterize the U.S., suggestions for more frequent sampling), and flexibility to address local-specific issues such as winter time wood smoke, or the need to support related scientific studies, which might require more intensive seasonal sampling and analysis. This component of the program does provide true flexibility for State and local agencies. Certain States (e.g., California) have expressed an interest in establishing more advanced methods capable of in-situ, near continuous measurements of principal species. Given the flexibility of this component of the National program, substantial opportunity exists to interact with the health and atmospheric chemistry research communities. With the exception of the supersites

program, however, all of these components are funded by State Grants, which provide hardware and related capital costs, laboratory analyses, and salaries for State and local agencies to operate the network. Consequently, the dialogue must involve EPA, State and local agencies, and the research community.

3. **IMPROVE Sites (108).** In addition to 30 existing EPA supported sites, 78 new IMPROVE sites are being added, in or near Class I Federal areas (e.g. national parks and wilderness), to address the requirements of the forthcoming Regional Haze regulations. These sites conduct speciation sampling similar to the 50 NAMS, but on a 1/3 day sampling interval. These sites are considered as part of the entire PM<sub>2.5</sub> National network, recognizing that the technical connections (e.g., sources/ambient characterizations, measurement techniques) between PM<sub>2.5</sub> and visibility require integration. Although funded through State Grant funds, this program is managed by the IMPROVE Steering Committee, and most of the technical work conducted by Universities and the Federal Land Managers.

**SUPER SITES (4-10).** EPA plans to conduct special detailed chemical and physical characterization studies in 4 to 10 areas that reflect a range of characteristic PM<sub>2.5</sub> source-receptor and health risk situations. The scope and specific details of this program, termed “super sites,” are being developed through substantial input from the scientific community, including the July 22-23rd workshop in RTP. The following discussion outlines EPA’s overall objectives for the program and the relationship to other components.

The major objectives common to all of the “Supersite” study areas include elucidation and study of source-receptor relationships to enable improved implementation and tracking of strategy effectiveness in the overall PM program, providing a basis for improved health risk assessments, and serving as vehicle for comparing emerging sampling methods with routine techniques to enable a smooth transition to advanced methods. The first two objectives reflect an attempt to increase the temporal, chemical, phase and size fraction resolution of measurements relative to “routine” monitoring programs that typically are limited, for example, to intermediate averaging times (e.g., 24 hrs.) and single size ranges.

To optimize the use of these resources for the scientific priorities identified by the NAS panel, planning for the super site program is being integrated with EPA’s PM research planning. The kinds and extent of equipment and the spatial and temporal extent of monitoring in each study area will be tailored to address one or more additional objectives related to the research program. Specific research needs being evaluated include improved source apportionment methodologies, exposure assessment studies, diagnostic studies to elucidate atmospheric process dynamics associated with the formation, accumulation and removal of PM<sub>2.5</sub> constituents and other associated (e.g., oxidants) atmospheric species, epidemiology studies, and interactive analyses to support toxicology.

This integrated research/supersite area planning is also taking into account the speciation and continuous mass monitoring programs outlined above. Each of the special study areas will be points for focus for these programs as well. The spatial requirements for characterizing the

multiple interacting spatial scales (horizontal) can not be addressed by supersites and in this context routine sites can be viewed as satellites for greater spatial detail. Relatedly, the supersites can provide vertical scale resolution (through optical techniques, elevated platforms, periodic aircraft flights) not expected to be part of routine networks, but nonetheless important for addressing the research and regulatory needs outlined above.

#### List of Acronyms

PM<sub>2.5</sub> = Particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers

PM = Particulate Matter

EPA = Environmental Protection Agency

NAMS = National Air Monitoring Station

SLAMS = State/Local Air Monitoring Station

NAAQS = National Ambient Air Quality Standards

FRM = Federal Reference Methods

FEM = Federal Equivalency Methods

SPM = Special Purpose Monitoring

IMPROVE = Interagency Monitoring of Protected Visual Environments

PSI = Pollutant Standards Index

## Overview of National PM<sub>2.5</sub> Network

Site Category	Projected Number	Major Purpose	Potential Flexibility for Research
Core Sites	850 FRM/FEM measure PM <sub>2.5</sub> mass. Also 50 collocated monitors measure continuous mass	Minimum required for designations. FRM and network design peer reviewed by CASAC. Continuous required for PSI reporting.	Limited. States follow EPA guidance on location according to population, other factors. Frequency of sampling could be adjusted at some.
Spatial Averaging/ Special Purpose	200 FRM/FEM, other	States requested additional monitors for spatial averaging for attainment designations. SPMs limited duration (<2 yr), e.g. source attribution study	Locations determined by States according to local circumstances. SPM might be adjusted to accommodate research
IMPROVE	100 additional IMPROVE monitors	Supports regional haze rules in class I areas and PM <sub>2.5</sub> transport assessment. Chemical speciation.	Limited to class I areas.
Chemical Speciation	300 sites with “routine” chemical analyses	Trends, source attribution of major chemical species, for source apportionment, risk assessment. Regional variations encouraged.	Substantial flexibility to accommodate health and other research subject to resource limitations on frequency.
Continuous	50 additional continuous PM <sub>2.5</sub> mass monitors	PSI reporting and further delineation of source/exposure patterns	Substantial flexibility to support exposure studies.
<b>Total</b>	<b>1500 Sites</b>		

In addition 4 to 10 Supersites not included in above with research grade instrumentation will be established for health risk and source assessment work integrated with research program. The design of this program is fully flexible for incorporation into other priority scientific research on PM.